

WHAT IS CLAIMED IS:

1. A substrate processing apparatus comprising:

5 (a) a substrate holding part to hold a substrate in its substantially horizontal position;

(b) a rotary part to rotate a substrate held by said substrate holding part in a substantially horizontal plane;

(c) a processing liquid supply part to selectively supply a plurality of types of processing liquids to a substrate held by said substrate holding part;

10 (d) a plurality of guide parts of substantially annulus ring shape that receives a processing liquid flying spattering from a substrate in rotation, on the side of a substrate held by said substrate holding part ;

(e) a plurality of processing liquid passages of substantially cylindrical shape that are provided to said plurality of guide parts in one-to-one correspondence and feed
15 downwardly a processing liquid introduced from their corresponding guide parts; and

(f) a position adjusting part to adjust the physical relationship between said substrate held by said substrate holding part and each of said guide parts, such that a processing liquid flying spattering from a substrate in rotation is received by a guide part corresponding to the recovery type of the processing liquid,

20 said plurality of guide parts comprising:

(d-1) a first processing liquid guide part to receive a first processing liquid flying spattering from a substrate in rotation; and

(d-2) a plurality of second processing liquid guide parts that are stacked in multistage on said first processing liquid guide part and receive a second processing
25 liquid flying spattering from a substrate in rotation, and wherein

a maximum internal diameter of at least the lowermost second processing liquid guide part in said plurality of second processing liquid guide parts is greater than an internal diameter of a processing liquid passage corresponding to said lowermost second processing liquid guide part.

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2. The substrate processing apparatus according to claim 1 wherein said first processing liquid is pure water and said second processing liquid is a chemical solution.

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3. The substrate processing apparatus according to claim 2 wherein disposed are a plurality of first recovery tanks corresponding to said second processing liquid guide parts so as to recover, through said processing liquid passages, a second processing liquid flying spattering from said substrate by rotation, said apparatus further comprising:

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(g) a plurality of storage parts that are located separately below said plurality of first recovery tanks so as to correspond to said plurality of first recovery tanks, respectively, each storage part including:

(g-1) a storage tank having an inside space shape that is approximately the same as internal space shape of the corresponding said first recovery tank; and

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(g-2) a plurality of pipes to connect in communication at a plurality of locations between the bottom of said corresponding said first recovery tank and the inside of said storage tank.

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4. The substrate processing apparatus according to claim 3 wherein disposed is a second recovery tank corresponding to said first processing liquid

guide part so as to recover, through a processing liquid passage, said first processing liquid flying spattering from said substrate by rotation,

said apparatus further comprising:

- 5 (h) a discharge pipe through which said first processing liquid recovered in said second recovery tank is discharged and discarded to the exterior.

10 5. The substrate processing apparatus according to claim 4 wherein said storage tanks contained in each of said plurality of storage parts are stacked one upon another substantially vertically.

6. The substrate processing apparatus according to claim 5, further comprising:

- 15 (i) a first processing liquid discharge part that has a discharge port disposed in said first processing liquid guide part and discharges said first processing liquid from said discharge port to said substrate holding part.

20 7. The substrate processing apparatus according to claim 6 wherein said first processing liquid guide part is located at a position lower than the lowermost said second processing liquid guide part.

8. The substrate processing apparatus according to claim 7 wherein said first processing liquid guide part includes:
a liquid passage that is formed in said first processing liquid guide part and connected in communication to said processing liquid supply part; and
25 a discharge part that is disposed on the inner peripheral surface side of said first

processing liquid guide part and discharges said first processing liquid supplied from said processing liquid supply part to said substrate holding part via said liquid passage connected in communication.

5 9. The substrate processing apparatus according to claim 8, further comprising:

(j) a pipe that is disposed below said liquid passage and moves relatively with respect to said liquid passage; and

(k) a relay pipe to provide communication between said liquid passage and said
10 pipe, said relay pipe being flexibly disposed.

10. A substrate processing apparatus comprising:

(a) a substrate holding part to hold a substrate in its substantially horizontal position;

15 (b) a rotary part to rotate said substrate held by said substrate holding part in a substantially horizontal plane;

(c) a processing liquid supply part to selectively supply a plurality of types of processing liquids to said substrate held by said substrate holding part;

(d) a plurality of guide parts of substantially annulus ring shape that receives a
20 processing liquid flying spattering from a substrate in rotation on the side of said substrate held by said substrate holding part ;

(e) a plurality of processing liquid passages of substantially cylindrical shape that are provided to said plurality of guide parts in one-to-one correspondence and feed downwardly processing liquids introduced from their corresponding guide parts; and

25 (f) a position adjusting part to adjust the physical relationship between said

substrate held by said substrate holding part and said guide parts, such that a processing liquid flying spattering from a substrate in rotation is received by a guide part corresponding to the recovery type of the processing liquid,

said plurality of guide parts comprising:

5 (d-1) a first processing liquid guide part to receive a first processing liquid flying spattering from a substrate in rotation; and

(d-2) a plurality of second processing liquid guide parts that are stacked in multistage on said first processing liquid guide part and receive a second processing liquid flying spattering from a substrate in rotation, and wherein

10 said lowermost second processing liquid guide part is disposed such that the lowermost chemical guide part in said plurality of second processing liquid guide parts covers above of a processing liquid passage that corresponds to the second processing liquid guide part immediately overlying the second processing liquid guide part of said the lowermost second processing liquid guide part.

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11. The substrate processing apparatus according to claim 10 wherein said first processing liquid is pure water and said second processing liquid is a chemical solution.

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12. The substrate processing apparatus according to claim 11 wherein disposed are a plurality of first recovery tanks corresponding to said second processing liquid guide parts so as to recover, through said processing liquid passages, a second processing liquid flying spattering from said substrate by rotation,

said apparatus further comprising:

25 (g) a plurality of storage parts that are located separately below said plurality of

first recovery tanks so as to correspond to said plurality of first recovery tanks, respectively, each storage part including:

(g-1) a storage tank having an inside space shape that is approximately the same as internal space shape of the corresponding said first recovery tank; and

5 (g-2) a plurality of pipes to connect in communication at a plurality of locations between the bottom of said corresponding said first recovery tank and the inside of said storage tank.

13. The substrate processing apparatus according to claim 12 wherein
10 disposed is a second recovery tank corresponding to said first processing liquid guide part so as to recover, through said processing liquid passages, said first processing liquid flying spattering from said substrate by rotation,

said apparatus further comprising:

(h) a discharge pipe through which said first processing liquid recovered in said
15 second recovery tank is discharged and discarded to the exterior.

14. The substrate processing apparatus according to claim 13 wherein
said storage tanks contained in each of said plurality of storage parts are stacked one upon another substantially vertically.

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15. The substrate processing apparatus according to claim 14, further comprising:

(i) a first processing liquid discharge part that has a discharge port disposed in said first process liquid guide part and discharges said first processing liquid from said
25 discharge port to said substrate holding part.

16. The substrate processing apparatus according to claim 15 wherein said first processing liquid guide part is located at a position lower than the lowermost said second processing liquid guide part.

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17. The substrate processing apparatus according to claim 16 wherein said first processing liquid guide part includes:

a liquid passage that is formed in said first processing liquid guide part and connected in communication to said processing liquid supply part; and

10 a discharge part that is disposed on the inner peripheral surface side of said first processing liquid guide part and discharges said first processing liquid supplied from said processing liquid supply part to said substrate holding part via said liquid passage connected in communication.

15 18. The substrate processing apparatus according to claim 17, further comprising:

(j) a pipe that is disposed below said liquid passage and moves relatively with respect to said liquid passage; and

(k) a relay pipe to provide communication between said liquid passage and said
20 pipe, said relay pipe being flexibly disposed.

19. A substrate processing apparatus to perform a predetermined substrate processing by supplying a processing liquid to a substrate while rotating the substrate, comprising:

25 (a) a substrate holding part to hold a substrate in its substantially horizontal

position;

(b) a rotary part to rotate said substrate held by said substrate holding part in a substantially horizontal plane;

(c) a processing liquid supply part to selectively supply a plurality of types of
5 processing liquids to a substrate held by said substrate holding part;

(d) a four-stage splash guard that is disposed so as to annularly circumscribe a substrate held by said substrate holding part and is composed of a first guard, second guard, third guard and fourth guard arranged in inner-to-outer order; and

(e) a lifting part to lift and lower said splash guard substantially vertically, and
10 wherein

in a vertical direction, an inside of said first guard, a space between said first and second guards, a space between said second and third guard, and a space between said third and fourth guards serve as a first guide part, second guide part, third guide part and fourth guide part, respectively,

15 in a horizontal direction, the inside of said first guard, the space between said first and second guards, the space between said second and third guard, and the space between said third and fourth guards serve as a first processing liquid passage, second processing liquid passage, third processing liquid passage and fourth processing liquid passage, respectively,

20 said second guard is curved such that the maximum internal diameter of said second guide part is greater than the internal diameter of said second processing liquid passage,

said first guard receives a first processing liquid flying spattering from a substrate in rotation, and

25 said second, third and fourth guards receive a second processing liquid flying

spattering from a substrate in rotation.

20. The substrate processing apparatus according to claim 19 wherein
said first processing liquid is pure water and said second processing liquid is a
5 chemical solution.

21. The substrate processing apparatus according to claim 20 wherein
disposed are a plurality of first recovery tanks that correspond to said second,
third and fourth processing liquid passages and recover a second processing liquid flying
10 spattering from said substrate by rotation,
said apparatus further comprising:

(f) a plurality of storage parts that are located separately below said plurality of
first recovery tanks so as to correspond to said plurality of first recovery tanks,
respectively, each storage part including:

15 (f-1) a storage tank having an inside space shape that is approximately the same
as internal space shape of the corresponding said first recovery tank; and

(f-2) a plurality of pipes to connect in communication at a plurality of locations
between the bottom of said corresponding said first recovery tank and the inside of said
storage tank.

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22. The substrate processing apparatus according to claim 21 wherein
disposed is a second recovery tank that corresponds to said first guard and
recovers said first processing liquid flying spattering from said substrate by rotation,
said apparatus further comprising:

25 (g) a discharge pipe through which said first processing liquid recovered in said

second recovery tank is discharged and discarded to the exterior.

23. The substrate processing apparatus according to claim 22 wherein
said storage tanks contained in each of said plurality of storage parts are
5 stacked one upon another substantially vertically.

24. The substrate processing apparatus according to claim 23, further
comprising:

(h) a first processing liquid discharge part that has a discharge port disposed in
10 said first guard and discharges said first processing liquid from said discharge port to said
substrate holding part.

25. The substrate processing apparatus according to claim 24 wherein
said first guard is located at a position lower than the lowermost one of said
15 second, third and fourth guards.

26. The substrate processing apparatus according to claim 25 wherein
said first guard includes:
a liquid passage that is formed in said first guard and connected in
20 communication to said processing liquid supply part; and

a discharge part that is disposed on the inner peripheral surface side of said first
guard and discharges said first processing liquid supplied from said processing liquid
supply part to said substrate holding part via said liquid passage connected in
communication.

27. The substrate processing apparatus according to claim 26, further comprising:

(i) a pipe that is disposed below said liquid passage and moves relatively with respect to said liquid passage; and

5 (j) a relay pipe to provide communication between said liquid passage and said pipe, said relay pipe being flexibly disposed.

28. A substrate processing apparatus to perform a predetermined substrate processing by supplying a processing liquid to a substrate while rotating said substrate,
10 comprising:

(a) a substrate holding part to hold a substrate in its substantially horizontal position;

(b) a rotary part to rotate a substrate held by said substrate holding part in a substantially horizontal plane;

15 (c) a processing liquid supply part to selectively supply a plurality of types of processing liquids to a substrate held by said substrate holding part;

(d) a four-stage splash guard that is disposed so as to annularly circumscribe a substrate held by said substrate holding part and is composed of a first guard, second guard, third guard and fourth guard arranged in inner-to-outer order; and

20 (e) a lifting part to lift and lower said splash guard substantially vertically, and wherein

in a vertical direction, an inside of said first guard, a space between said first and second guards, a space between said second and third guard, and a space between said third and fourth guards serve as a first guide part, second guide part, third guide part

25 and fourth guide part, respectively,

in a horizontal direction, the inside of said first guard, the space between said first and second guards, the space between said second and third guard, and the space between said third and fourth guards serve as a first processing liquid passage, second processing liquid passage, third processing liquid passage and fourth processing liquid passage, respectively,

said second guard is curved such that the maximum internal diameter part of said second guide part covers above said third processing liquid passage,

said first guard receives a first processing liquid flying spattering from a substrate in rotation, and

said second, third and fourth guards receive a second processing liquid flying spattering from a substrate in rotation.

29. The substrate processing apparatus according to claim 28 wherein said first processing liquid is pure water and said second processing liquid is a chemical solution.

30. The substrate processing apparatus according to claim 29 wherein disposed are a plurality of first recovery tanks that correspond to said second, third and fourth processing liquid passages and recover a second processing liquid flying spattering from said substrate by rotation,

said apparatus further comprising:

(f) a plurality of storage parts that are located separately below said plurality of first recovery tanks so as to correspond to said plurality of first recovery tanks, respectively, each storage part including:

(f-1) a storage tank having an inside space shape that is approximately the same

as internal space shape of the corresponding said first recovery tank; and

(f-2) a plurality of pipes to connect in communication at a plurality of locations between the bottom of said corresponding said first recovery tank and the inside of said storage tank.

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31. The substrate processing apparatus according to claim 30 wherein disposed is a second recovery tank that corresponds to said first guard and recovers said first processing liquid flying spattering from said substrate by rotation, said apparatus further comprising:

10 (g) a discharge pipe through which said first processing liquid recovered in said second recovery tank is discharged and discarded to the exterior.

32. The substrate processing apparatus according to claim 31 wherein said storage tanks contained in each of said plurality of storage parts are
15 stacked one upon another substantially vertically.

33. The substrate processing apparatus according to claim 32, further comprising:

20 (h) a first processing liquid discharge part that has a discharge port disposed in said first guard and discharges said first processing liquid from said discharge port to said substrate holding part.

34. The substrate processing apparatus according to claim 33 wherein said first guard is located at a position lower than the lowermost one of said
25 second, third and fourth guards.

35. The substrate processing apparatus according to claim 34 wherein
said first guard includes:

5 a liquid passage that is formed in said first guard and connected in
communication to said processing liquid supply part; and

a discharge part that is disposed on the inner peripheral surface side of said first
guard and discharges said first processing liquid supplied from said processing liquid
supply part to said substrate holding part via said liquid passage connected in
communication.

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36. The substrate processing apparatus according to claim 35, further
comprising:

(i) a pipe that is disposed below said liquid passage and moves relatively with
respect to said liquid passage; and

15 (j) a relay pipe to provide communication between said liquid passage and said
pipe, said relay pipe being flexibly disposed.